

# CLAIMS

What is claimed is:

1. A method for deriving barycentric coordinates for a point  $\mathbf{p}$  within an  
5 n-sided polygon, wherein, for a particular coordinate  $w_j$ , corresponding to a vertex  $\mathbf{q}_j$ ,  
the method embodies a formula which may be expressed as follows:

$$w_j = \frac{\cot(\gamma_j) + \cot(\delta_j)}{\|\mathbf{p} - \mathbf{q}_j\|^2}$$

where  $\delta_j$  and  $\gamma_j$  are adjacent angles to the edge  $\mathbf{p}\mathbf{q}_j$  at the vertex  $\mathbf{q}_j$ .

2. The method of claim 1 tangibly embodied on or in a memory.

3. The method of claim 2 wherein a series of instructions or program  
10 code embodying the method is stored in a memory.

4. A method for deriving weights  $w_{ij}$  for expressing a vertex  $\mathbf{q}_i$  in a mesh  
representation of an object surface in terms of its one-ring neighbors  $\mathbf{q}_j, \forall j \in N(i)$ ,  
wherein, for a particular weight  $w_{ij}$ , corresponding to a vertex  $\mathbf{q}_j$ , the method  
15 embodies a formula which may be expressed as follows:

$$w_{ij} = \frac{\cot(\gamma_j) + \cot(\delta_j)}{\|\mathbf{q}_i - \mathbf{q}_j\|^2}$$

where  $\delta_j$  and  $\gamma_j$  are adjacent angles to the edge  $\mathbf{q}_i\mathbf{q}_j$  at the vertex  $\mathbf{q}_j$ .

5. The method of claim 4 tangibly embodied on or in a memory.

6. The method of claim 5 wherein a series of instructions or program  
20 code embodying the method is stored in a memory.

7. A method of parameterizing a mesh representation of an object surface  
comprising the steps of:

for one or more vertices  $\mathbf{q}_i$  of the mesh representation, computing for one or  
more of its one-ring neighbors  $\mathbf{q}_j, \forall j \in N(i)$ , a weight  $w_{ij}$  in accordance with the  
25 following formula:

$$w_{ij} = \frac{\cot(\gamma_j) + \cot(\delta_j)}{\|\mathbf{q}_i - \mathbf{q}_j\|^2}$$

where  $\delta_j$  and  $\gamma_j$  are adjacent angles to the edge  $\mathbf{q}_i\mathbf{q}_j$  at the vertex  $\mathbf{q}_j$ ; and

responsive to one or more of the weights  $w_{ij}$  determined in the foregoing step, determining the parameterized coordinates of one or more of the vertices of the mesh representation.

8. The method of claim 7 further comprising fixing the positions of one or more boundary vertices in parameter space.

9. The method of claim 8 further comprising assigning each of these vertices a position on a fixed boundary  $\mathbf{C}$ , where the position on the fixed boundary  $\mathbf{C}$  assigned to a vertex  $i$  may be referred to as  $\mathbf{C}_u$ .

10. The method of claim 9 further comprising solving the following system of linear equations in order to derive the parameterization of the mesh representation:

$$\forall i, i \in [1 \dots n], \begin{cases} \sum_{j \in N(i)} w_{ij} (\mathbf{u}_i - \mathbf{u}_j) = 0 & \text{if } i \text{ is an interior vertex} \\ \mathbf{u}_i = \mathbf{C}_u & \text{if } i \text{ is a boundary vertex} \end{cases}$$

where  $\mathbf{u}_i$  is the vertex  $i$  in parameter space (and  $\mathbf{u}_j$  is the vertex  $j$  in parameter space), and  $\mathbf{C}_u$  is the boundary position in parameter space assigned to the boundary vertex  $i$ .

11. A method of parameterizing a mesh representation of an object surface comprising the steps of:

a step for computing, for one or more vertices  $\mathbf{q}_i$  of the mesh representation and one or more of its one-ring neighbors  $\mathbf{q}_j$ ,  $\forall j \in N(i)$ , a weight  $w_{ij}$  in accordance with the following formula:

$$w_{ij} = \frac{\cot(\gamma_j) + \cot(\delta_j)}{\|\mathbf{q}_i - \mathbf{q}_j\|^2}$$

where  $\delta_j$  and  $\gamma_j$  are adjacent angles to the edge  $\mathbf{q}_i\mathbf{q}_j$  at the vertex  $\mathbf{q}_j$ ; and

a step for determining, responsive to one or more of the weights  $w_{ij}$  determined in the foregoing step, the parameterized coordinates of one or more of the vertices of the mesh representation.

12. The methods of any of claims 1-11 tangibly embodied on or in a memory.

13. The memory of claim 12 wherein the method is embodied as a series of instructions or program code stored in the memory.